

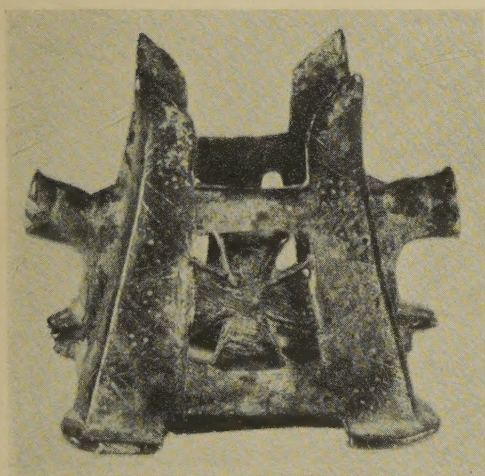
ANCIENT EGYPT

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PART II.

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THE BUILDING OF A PYRAMID.

THE difficulties of constructing the pyramidal form which, when finished, left no place to support the masons engaged on it, have long been talked about vaguely; many impossible processes have been suggested, but the difficulties have never been met, from start to finish. The latest publication of architect and engineer combined has provided a chapter on "Pyramid Construction," but they have not attempted to clear up the essential difficulties nor to show how such a result was possible.

First we should take account of the means that were available to the Egyptians. That they used *earth banking* on an immense scale, as a working platform, is certain (1) from the remains of such banking at one of the later works, the Ptolemaic pylon of Karnak; (2) the description of a long sloping bank 1260 ft. long, 94 ft. wide, and sloping 103 ft. up the sides, for erecting statues under Ramessu IV; and (3) a great earth causeway from a quarry at Qau, divided by cross-walls of brickwork filled up with earth. Such a system was recently revived with full success at Karnak, in the repair of a hall, where it was filled up with sand to form a working platform on which to lay the roof beams.

Another principle was the employment of *large teams of men*, moving quickly by main force. This is instinctive to the people at present. When I needed to move a block of two or three tons, our men would get out the thick ropes, lash them firmly round it, smooth out any hollows in the way, and then, calling fifty men off work a little before sunset, they would all take places and walk away with the block, over any rough ground, up the bank of old wall at Abydos and down the other side, without any hesitation. The transport of an immense colossus by a team of 172 men is a well-known picture of the xviiith dynasty. The great levy of thousands of men during the inundation is essential to any programme of pyramid work. The choice lies between a slow method with few men in modern times, and a quick method with full power anciently.

Safety was essential for the Egyptian; the large numbers of peasants could not be expected to deal with risky work; the methods must be fool-proof, so that nothing can break away by oversight, and no catastrophes lie in the way. Any apparatus must have been of the simplest kind.

Appliances were very few. The lever and the roller were about all that were used. There was no pulley till Roman times; for raising sails the ropes merely ran through loops of rope, not over pulleys: any lifting by haulage over a pulley is impossible. Rocking up on two piles of blocks placed near the middle of a long beam may probably be expected for small amounts of motion. Large lifting could be done by using slopes.

Such being the means, the results obtained delimit the possible ways of working. The transport must have been rapid; 500 blocks, each of some tons, had to be brought over from the quarries and built into place every day. Thus at every stage of the work 500 blocks must have passed on in a day to the next stage, and each stage manned sufficiently for this. A wide approach and wide working face was essential, no narrow tracks up pyramid faces would do, except for a hundredth of the work at the top. The flow of movement must have been as intensive, and as certain not to break down, as in mass-production engineering today.

The method must have allowed of placing all the casing in position with finished face, and putting on the top stone about six feet square. It must have allowed for accurate building to plan, without any loss of squareness or of true angle from the base upward. It did provide for laying the casing ready faced, for at the largest blocks at the base (where dressing in place would be most expected) there is a small difference of angle between the blocks at their junction, proving that the faces have not been even smoothed since being built together. The method must account for the importance of a deeper line of casing specially laid up the middle of each face.

A great question is the meaning of having structural faces at 75° in the mass, beneath the casing of 51° . Such faces exist at the Step Pyramid (iiird dynasty) without any 51° casing, so far as is yet ascertained. There are internal faces at Meydum (iiird dynasty), and at Abusir (vth dynasty), also in the Pepy pyramid (vth). At the last no doubt they were structural, as the bulk was merely of chips thrown in, and needing retaining walls. At Meydum they may belong to an early stage of design, like the Step Pyramid, afterward re-modelled by a 51° casing. No such internal faces are known at the Great Pyramid or Second pyramid, probably not at the Third. If they existed there would be some trace visible in the core blocks, especially in the deep hole made in the south face by Howard Vyse. For these pyramids we need not take internal faces into account. A true remark has been made that any system of building in successive coats would be extremely wasteful of the slopes of ascent, which would have to be reconstructed for each coat: the conclusion has therefore been drawn that the internal faces at Abusir were all in progress together at the same level, and their purpose is for binding the structure, and in a traditional succession from the primitive mastaba.

The design of the Great Pyramid shows no trace of any enlargement; the passage system demands almost the full size from the first, and the modulus of 40 cubits following on that of 25 at Meydum marks the design as original, and not increased by any small addition. The earth ramp needed for raising the stones must have been of great size, almost of the volume of the pyramid itself. It could not be shorter than shown here (Fig. 1) or the final slope would be too steep; it could not be narrower because a full sized front was needed to get up the stones for the lower courses, about 50,000 blocks in each course. Also for the height the base must have been as wide, as we can hardly suppose that the sides of the earth bank could be maintained for 400 ft. high, with a brick facing steeper than 51° . It would be possible for the lowest corners to have been narrower, making the foot width more like the top width, but it would be a small economy at the loss of having a much steeper slope for the earlier ramps. It would be a great facility in handling the 50,000 blocks *per* course

to have as gentle a slope as possible, as that would enable the blocks to be moved up it much more rapidly. So practically the full width at the foot, and low grade slopes at first, seems much the most advantageous form.

The successive heightening of the bank as the work grew would probably be done by moving the stones forward on it till half was clear, and raising that, as the stone moved forward, till a whole course was moved in and laid. Thus the lower part would consolidate before the stone for the next course arrived on it; in fact there would be continual waves of stone work and earth facing, alternately moving forward up the bank.

The height of the ramp is a difficult question. Certainly it cannot have continued to the top of the pyramid, as there would be no room to work on it, and if once wider than the face it would need an immense deal more earth on the adjacent faces. The pressure of the facing wall at the bottom would be relieved by its banking against the earth filling; a sheer wall on its own

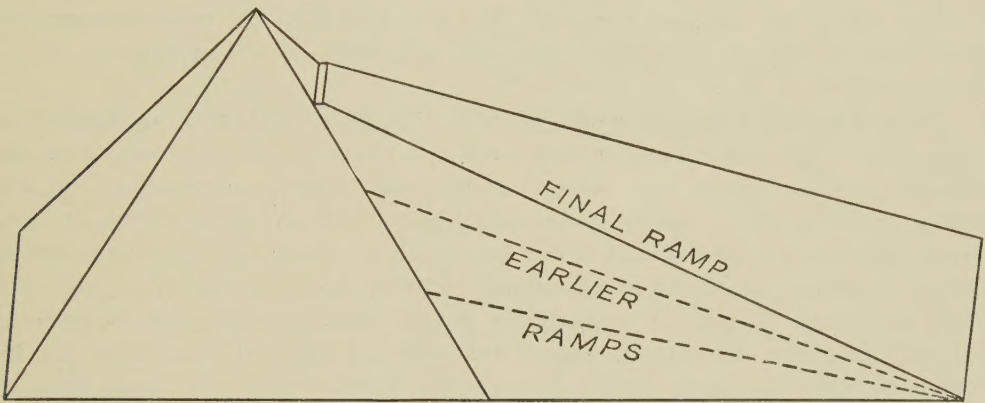


Fig. 1.

footing could hardly be over 150 feet. There was a wall of 92 feet at Memphis, and chalk will crush with 600 feet of its own height; somewhere between these must be the limit for mud brick. So if we allow that the brick facing and bank rose to 380 ft., or 100 below the apex, it would be as far as is likely. At this level the face would be 150 feet wide, which would allow a safe margin, so as not to put weight near the edge. Above that level the raising must have depended on a support of stone.

Next we must consider the order of the building. When stones are raised up a slope to the building level, the obviously simple method would be to place the course of casing in position round the edge, and then fill up the space with core blocks. This method may explain the close fit of the vertical joints. If a block were a few feet inside the position and were slid forward, along its side joint, the joint face of the fixed block could be brushed over with fresh plaster in front of the sliding block and immediately covered as that ran along. The flat back to the block would enable force to be applied.

How then could the casing be placed truly in position? As already stated, the casing at the base was not dressed finally when in position, as the faces are slightly out of plane. The stone was cut to the angle before laying, though perhaps the feather edge below might have a little excess to save it, easily

ground off later. The angle was first of all accurately set out on the rise up the middle of the face, which was deeper and therefore more carefully built. For this the stone face below would be the first guide, and could be checked by measurement across the pyramid. Knowing how the Egyptian marked out axes on his stone work, and how in the middle of the Hawara pyramid the axis had been marked out with supplementary signs at 2 cubits each side of it (*Kahun*, p. 14), it is most likely that axis lines were kept up carefully during the construction. At every 14 cubits up, the face must be 11 cubits nearer to the cross axis. When once a stone was put in its true place on the mid-face line, then all others could be adjusted by sighting over that line to the base, for every part of the face must lie in the plane defined by the mid line and the base. The corners also could be directly measured from the axis lines. Three faces would be always clear and visible, with finished surfaces up to date. The face covered with the earth ramp might perhaps be left in the rough, but it would be much more difficult to dress it truly while the lower part was invisible. It would be easier to set the mid line true by measurement from others and from the axis, and then put the rest of the course in line to the corner.

Quite different problems came in view (Fig. 2) when within a hundred feet of the apex. The brick ramp could hardly be trusted not to crush; moreover it would be too narrow for safety, as the edge might break away. A stone staging of some kind would be needful, but could not suffice when a great amount had to be moved for the lower parts. Such a staging could stand on the casing stones left untrimmed and square, except down the mid line and edges which would be needed as a guide to future dressing down. Then when the apex was in place, the staging would be removed step by step and the face dressed smooth. To work safely, the staging would need to be more than one course wide, and to be used mainly sideways. On planning, this results in a series of side shifts and reversals. It therefore comes out perfected as a stone ramp zig-zagging up the face. If we allow for a working platform 20 feet wide and a ramp 20 feet wide, it would be quite practicable for getting up enough stones to finish the upper courses. Starting at about 1000 stones in a course, by the time the ramp and platform had to be reduced to 10 feet wide, there would only be about 60 stones to a course. It would hardly be practicable to carry on a regular ramp higher than 12 feet below the cap stone; the last six or eight courses would be left to be raised by direct levering in a safety pit in the middle, flanked by safety walls on each side. Last of all, the cap stone six feet wide (according to a xiith dynasty example) would be levered up on stone blocking outside the completed faces, on a sort of pedestal of blocks until it reached its proper level. From a platform thus outside the pyramid face, it could be slid forward on rollers until nearly in place. Then the mortar for its bed would be pushed forward beneath its edge, and on moving the block finally into position the rollers could drop into holes left in the core. It seems reasonably possible to complete the building at each level in this manner.

The staging of stone would then be taken off, and the top courses of that face trimmed down to the slope, about four feet at a time. The stones and the brick of the ramps would be taken down and stacked ready for the next pyramid.

In the diagram the front view of the stone staging is drawn across the face, with the depth back of each platform stated in feet. At the side is the sectional view of the staging, showing the top and face of each stage. Below is the horizontal plan of all the staging, showing the manner in which the reversals meet.

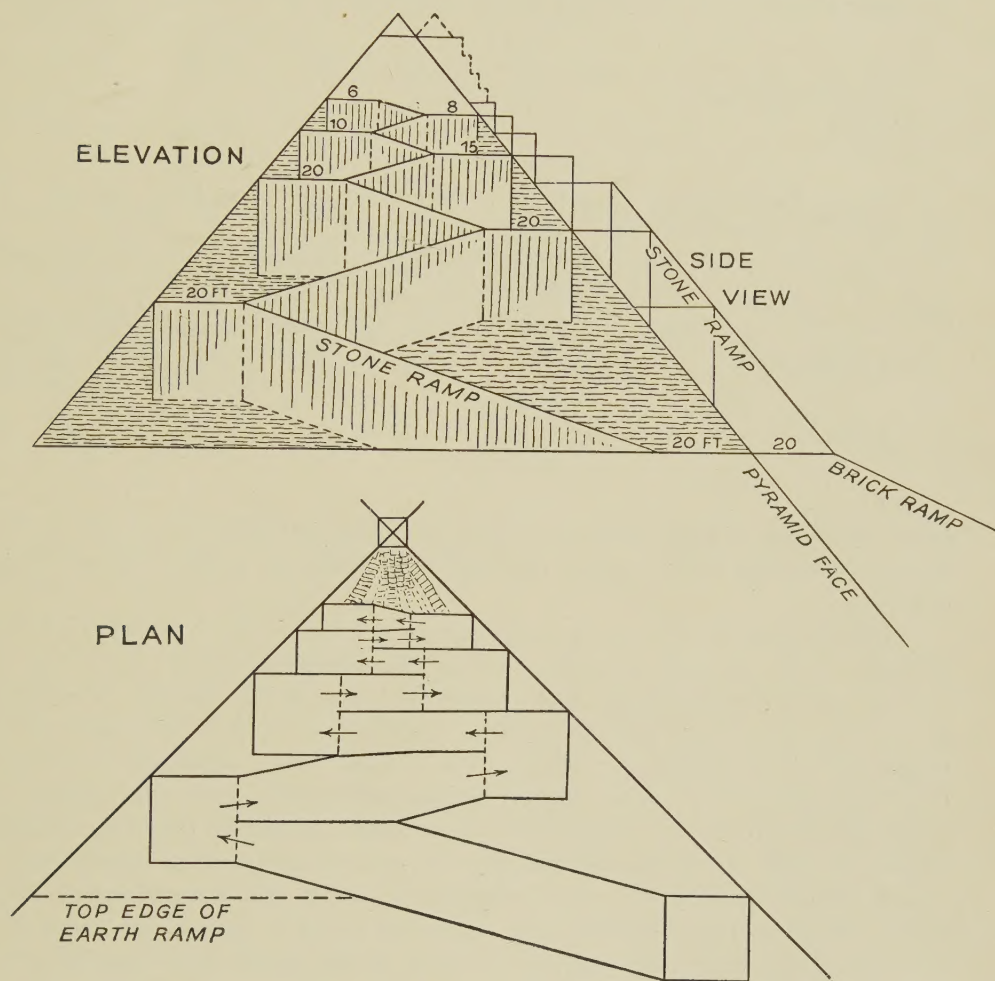


Fig. 2.

THE SLOPES OF PYRAMIDS.

There has been confusion in various writers on the subject of the angle of slope of different pyramids, owing to confusing theories with actual observations. The facts, as far as I could ascertain them on the spot, are set out below, with the probable error $\pm$ below each statement. This does not mean the limit of uncertainty as some writers state, but the limit within which half of the observations lie, the amount which is as likely to leave the true value within it as beyond it. There follows the most likely theoretical angle, and the proportions which produce it.

	Observed	Theory	Diff.	Proportions
Great pyramid	51° 52' ± 2	51° 50' 34"	1' 26"	14 on 11
„ „ passage	26° 31' 23" ± 5	26° 33' 54"	2' 31"	1 on 2
Second „	53° 10' ± 4	53° 7' 48"	2' 12"	4 on 3
Third „	51° 10' ± 2	51° 20' 25"	10' 25"	5 on 4
Ninth „	52° 11' ± 8	52° 7' 30"	3' 30"	9 on 7
South Dahshur low . .	55° 1' ± 5	55° 0' 29"	31"	10 on 7
„ „ high .	43° 5' ± 6	43° 1' 33"	3' 27"	14 on 15
„ „ small .	44° 34'	44° 25' 37"	8' 23"	10 over 7
Lahun	42° 35' ± 3	42° 30' 38"	4' 22"	11 on 12
Hawara	48° 45' ± 3	48° 48' 51"	3' 51"	8 on 7

Here there are 5 with differences less than the probable error, and 4 with differences greater, which agrees with what is likely in a series of intended connections.

The frequency of 7 in the proportions, six out of 10, is naturally due to the division of the cubit in 7 palms, so that the proportions were naturally set out in even numbers of palms. The proportions are, in all but one, a vertical rise on a horizontal base. The exception, 10 over 7, is a slope of 10 over a vertical height of 7: or perhaps 7 slope over a base of 5, resulting as 44° 24' 55". Although there is a wide chance of selecting some even proportion for an angle, yet the fit to the observations is as close as theory requires, without any chance fit, and the predominance of 7 is very unlikely to be accidental.

A check on such proposed proportions lies in the dimensions of the pyramids. If the Great Pyramid was to be as 14 on a base of 22, what was the modulus which went this number of times in the height and base length? This unit of length is 40 cubits. The angle of the pyramid of Meydum, next before that of Khufu, is not very accurately defined, but is certainly the same as that of Khufu. Its modulus is 25 cubits.

In order, therefore, we may set out similarly

	Ratio	Modulus
Meydum pyramid . . .	14 on 11	25 × 20·662
Gizeh, Great pyramid	14 on 11	40 × 20·610
Gizeh, Second „	4 on 3	80 × 17·656, $\frac{6}{7}$ of 20·599
Gizeh, Third „	5 on 4	25 × 20·77
Dahshur, South „	10 on 7	30 × 17·76, $\frac{6}{7}$ of 20·72

This discovery of the design of the two pyramids based on the short cubit, explains their dimensions, never before understood. Of the others, the ninth

pyramid has not been measured, the small pyramid of Dahshur and the Lahun pyramid are hundreds of cubits at the base, and the Hawara pyramid casing has not been found in place. Thus three pyramids have a modulus of 40, 25 and 25 cubits, while two are of 80, and 30 short cubits. The real intention of these proportions of height and base, which have been deduced from the angles, are thus amply confirmed by the unit or modulus of the proportions being in simple numbers of cubits.

FLINDERS PETRIE.

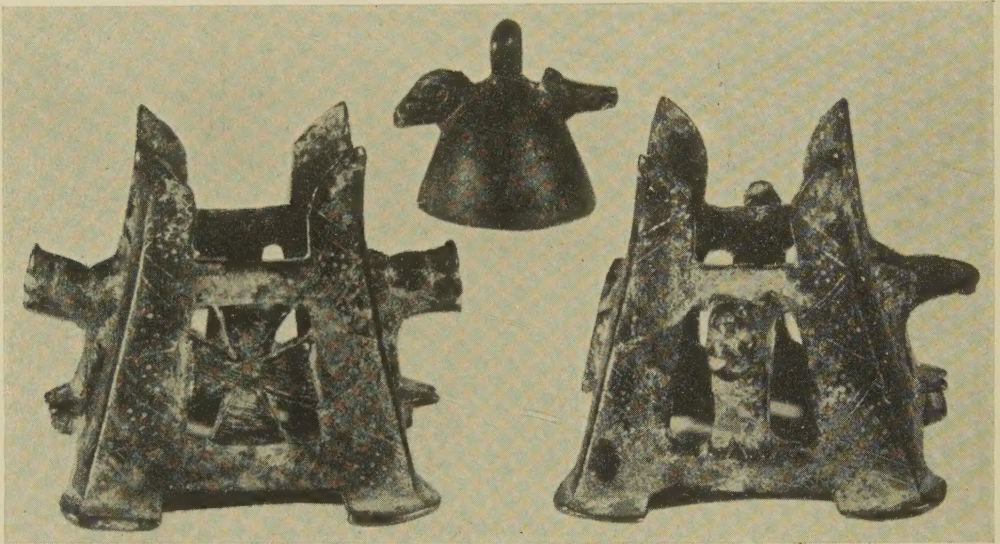
It need hardly be said to our readers that the extraordinary fallacies and misstatements about the Great Pyramid are lamentable nonsense. The prophetic theories which the writers elaborate are the substitutes for others of the past sixty years, always foretelling a few years ahead, and when disproved by events then shifted to new dates. A prophecy concerning fifty years hence would be safer but not so sensational.

F. P.

ALTAR AND BELL IN LATER EGYPTIAN RITES.

THE early Coptic object illustrated in Figs. 1 and 2 is of bronze, about two inches high and is now in the Coptic Museum at Old Cairo. It served as a stand for a small bottle which held a chrismal, the holy oil for chrism; on one side is figured a cross *patée*, while from the others project heads of animals, probably meant for lions and perhaps therefore connecting the object with St. Mark.

3



1

Figs. 1, 2, 3.

2

1, 2, Bronze Mosaic Altar. 3, Bell.

The latter feature is of interest, as it seems to be derived from an ancient Egyptian mode of decoration exemplified in the little bronze bell of the Saitic period, or possibly early Ptolemaic, illustrated in Fig. 3, from a private collection, height $1\frac{1}{4}$ inches. The heads on the bell are those of a ram and a dog, symbols of Ammon and Anubis, and there is little doubt that its use was of a ritual character. As the names of saints are moulded on the bells of Christian churches, replaced in Protestant countries by names of a person of the Trinity, so to this bell are affixed the sacred symbols of great gods.

While large bells seem to have been unknown to antiquity, small ones were used to announce the solemn moments of temple service, such as the offering of the sacrifice, as we may see from a Roman example of the iind century A.D., found in Spain, inscribed with the name of a temple-servant

Felix, "the younger announcer." This use may well have originated in the later times of Ancient Egypt, for the benefit of the congregation, in the newer forms of Isiac worship that then arose. In these the whole principle of public worship had completely changed from that which informed the older pharaonic rites, for it was now directed for the personal benefit of each worshipper individually; they formed a true congregation, taking part themselves in the service. Such worshippers would need guidance at the solemn moments of the rites and this would be well provided by a small bell, just as it is today in certain Christian services.¹

Another feature connecting our chrismal-stand with the later worship of Isis is its form, which is that of a Roman altar. Many miniature altars are to be seen in museums; some of exactly this shape are in Cairo, found in various parts of Egypt, while others exhibited in the British Museum (Room of Greek and Roman Life, Division "Religion"), are mostly of the solid table type; the Assyrians, too, had similar altars examples of which are shown in the British Museum (Babylonian and Assyrian Gallery, Room IV, wall-case 27). These objects are sometimes designated "fire-altars," a term which should be restricted to the Zoroastrian altars of the ancient Persians; they were in fact used for burning incense at domestic shrines and had, in Latin, the name *thuribula*. Several examples, mostly small rectangular blocks, have been found in Palestine, some are shown in the British Museum, Babylonian and Assyrian Gallery, Room II, centre-case (see also *Gerar*, pp. 18-19, pls. xl-xli). One of them follows the Roman tradition in the carved snake, representative of the ancestral *genius*, climbing up the altar to partake of the sacrifice; on another, the battlemented decoration of the top edges forms pointed horns at the corners, as on the chrismal-stand. Similar horns are found also on altars used in the later cult of Isis, as may be seen in the painted terracotta figurine from Egypt illustrated in Fig. 4, from a private collection. This is of the Roman period, height 6½ inches; the man, with shaven head and white



Fig. 4.
Priest of Isis with Altar.

¹ We may also note the inheritance from ancient Egypt of the use of holy water and incense and the robing and decorating of holy images; even some of the ritual formulae seem to have been passed on, such as the "Ite, missa est" dismissing from the Mass, corresponding to the concluding phrase of the Isiac service held at the beginning of spring for the happy opening of the navigating season—Isis being, like other elemental goddesses, the protectress of sailors;—the priest here dismissed the congregation with the words, spoken in Greek: "Depart, O peoples." (Apuleius, *The Golden Ass*, bk. XI.)

A further example from the same source is to be seen in the institution of god-parents, for Lucius, on his initiation into the Isiac mysteries, takes the priest who introduced him to them as his "father" (Apuleius, *op. cit.*, XI, 25).

robe worn so as to leave the upper torso bare, the *situla* for holy water hanging on his arm and, apparently, the *menat* over his shoulder, is a priest of Isis, showing all the features pictured in the well-known painted scene from Herculaneum, often illustrated, as, for example, in Moret's *Rois et Dieux d'Égypte*, pl. xvi. His hand is placed on a small altar, whose horizontal dimensions are narrow compared with its height; the casting is rough and the details of the altar are not very clear, but we can discern the presence at each upper corner of a projecting limb like the horns on the chrismal-stand. The altar is small enough to have been portable and thus it is possible that the priest was of an itinerant class like the rascally band which carried the "Syrian Goddess" round the country, as described in Books VIII and IX of *The Golden Ass*. On the other hand we know from the remains of the temple of Isis at Pompeii that, besides the great altar, there were several small ones ranged about the colonnade enclosing the great court which contained the sacred buildings; these were probably used for sacrifice by individual worshippers and corresponded in some sort to side-chapels in Christian churches; each one would have its attendant priest and it is perhaps such a one who is represented in our figurine.

To return to the bell, it is of course possible that it was worn as an amulet, for bells in ancient times were put to this use also: the clang of bronze or other metals kept evil spirits away—among others, those which cause eclipses of the moon, as can be witnessed in Egypt even today—and it seems that it was chiefly for this purpose that bells, perhaps more potent than shells or beads, were hung to the necks of domestic animals of all kinds or attached to children's bracelets. In ancient Egypt, models of bells like the one here illustrated were made of glazed frit-ware; they can only have served as amulets, like those in terra-cotta found in Greek tombs; the Babylonians, too, used bells in this way, moulding on them prophylactic figures: lastly, they have been worn in many places as a protection against the "evil eye."¹

¹ For illustrations of temples and rites referred to, see Moret, *op. cit.*, chapter V, and Georges Lafaye in Daremberg et Saglio, *Dict. des Antiquités Grecques et Romaines*, III, pp. 577 ff.: for bells see Ém. Espérandieu in the same, vol. V, pp. 341 ff. and A. J. Wheeler in Hastings' *Enc. of Religion and Ethics*, VI, pp. 313 ff.

Egyptian examples of the later periods are dealt with by Professor Petrie in *Objects of Daily Life*, Section 111 (see Pl. 1) and Section 55, where he suggests that bells may have been fixed to infants' bracelets in order to track them by the tinkle. Many specimens are described by him in *Hyksos and Israelite Cities*, Sect. 21 and on pp. 39 (graves 126 and 311), 40 (grave 660), 41 (grave 545) and 42 (grave 304).

For small portable altars see *Memphis IV and Roman Portraits*, Pl. xv.

G. D. HORNBLLOWER.

POSTSCRIPT TO "ANCESTOR-CULT IN ANCIENT EGYPT."

SINCE the above was written, Dr. Alan Gardiner has published in the *Journal of Egyptian Archaeology* (vol. XVI, pp. 19 ff.) "A new letter to the Dead" which provides striking evidence of the great lengths reached by Egyptians in their belief in the material powers of ancestral ghosts. In this anonymous petition to a dead father, dating between the viith-xith dynasties, the writer invokes his aid in matters similar to those forming the grounds of the petitions published by Gardiner and Sethe in *Egyptian Letters to the Dead*; he also adds the request that a healthy child may be born to him. Dr. Gardiner's article is followed by another by Dr. S. Schott, publishing a figurine in baked clay of a mother holding a child on her arm, both nude, dating from the Middle Kingdom, on which is inscribed the prayer: "May a birth be granted to thy daughter Seh." The author, following the interpretation of such figures generally accepted in Germany, describes this one as that of a "concubine," but, in view of the difficulty caused by the inscription, has found himself obliged to proffer a very involved explanation of how the "concubine" of a ghost could procure fertility for the ghost's daughter; it would surely be simpler and more rational to interpret the group as an example of the fertility-figures of the kind so widely spread of old over the region of the Eastern Mediterranean and still common in parts of Africa; as such, it would add enormously to the power of the lady's prayer. (See my article on this class of figures in the *Journal of Egyptian Archaeology*, vol. XV, pp. 29 ff. and specially p. 40, second par.; for Africa see Oskar Nuoffer, *Afrikanische Plastik in der Gestaltung von Mutter und Kind*, and the case of the goddess Odudua treated of by A. B. Ellis, *Yoruba-speaking peoples*, p. 43, &c.)

The belief in the power of ancestors to procure fertility has been found in other parts of Africa; Mr. E. Torday, in his illuminating article "Le fétichisme et la sorcellerie des Bantous" in *L'Anthropologie* (vol. XXXIX, 1929, pp. 431 ff.) gives many examples of the great strength of ancestor-cult among these people, a notable one being the reply of Queen Zinga, of the eighteenth century, to a missionary who asked her to whom was due the fertility of her realms—"My ancestors" (p. 432; compare also his further remarks in the *J. of the R. Anthropological Inst.*, vol. LVIII, 1928, p. 235). This answer would also be given today by the Bushongo king, of whom Mr. Torday says, in his book *On the trail of the Bushongo*, that he is called "God on earth" and that the spirit of the founder of his dynasty, Bamba, besides his power over sun, moon and rain, "makes the seeds to germinate and presides over the production of all that lives." I have myself witnessed something of the same turn of thought in modern Egypt, in spite of the severe monotheism of the Muslim religion; once as I was riding a few miles out of Tanta, I was met on the way by a dervish attached to the renowned saint-sheikh of that place, Sayid Ahmed el-Bedawi, who asked me, somewhat haughtily, for some tobacco

and, when he had pounced it, exclaimed: "Do you know by whose power you and your companion are here, and this land is green and fertile round us? it is that of the sheikh, our master, Sid Ahmed."

This theme could be illustrated at considerable length; but the examples given above will suffice to show that the ancient Egyptian beliefs were not isolated instances of strange credulity but were quite natural, in certain conditions, to the human mind; naïf they were but very real and, for the Egyptians, the maintenance of funerary rites for their dead fathers must have been an act not merely of filial piety but also of material personal advantage. It is true that it was the father himself who, if he could afford it, spent huge wealth in building his tomb and endowing it, full of care for his lasting comfort in the After-life and not trusting for this to his heirs, and it is this fact, recorded in a thousand monuments, that has obscured for us the real mutuality of the bond between the dead and the living of the ancient Egyptian family—an obscurity to be dissipated, it is hoped, by the considerations submitted above.

G. D. HORNBLOWER.

THE INFLUENCE OF EGYPT ON THE ART OF GREECE.

It is commonly taught that Greek archaic art took its inspiration from Egypt, and at first sight of a group of statuary such as the archaic "Apollon" in the National Museum at Athens, it is hard to believe that such a view may not be correct. Yet M. Deonna in his classic work *Les Apollons Archaiques*, reduces the Egyptian influence to nothing but the advanced left foot,¹ while M. Perrot² is of opinion that, the *shendet* removed, no influence is obvious at all. Where views so divergent are expressed, it may not be amiss to examine the evidence once more and to consider whether the first impression of intense Egyptianising is well founded.

The literary evidence is too well-known to linger over. Telekles and Theodorus of Samos made a composite statue after the manner of the Egyptians.³ That Theodorus had Egyptian leanings is proved by Pliny's statement that the bronze statue he made of himself had a scarab in its hand,⁴ and since Polykrates, ruler of Samos and friend of Amasis, was his patron he may really have visited Egypt during Amasis' reign (570-526 B.C.). That a Rhaekos did actually visit Naukratis about this time is proved by the discovery, in the lowest stratum of the temple of Aphrodite, of a vase dedicated by him to the goddess.⁵

The nude male standing figures belonging to the earliest phase of Greek sculpture are attributed as Apollo because for the most part they were found on the sites of temples of Apollo, whether on the Greek mainland, the Cycladic islands, or the coasts of Asia Minor. Occasionally their provenance is a tomb, and in these cases they must be regarded as funerary. The distinction however may not be very great, for they represent if not the god, yet the type of youthful beauty for which he stood. Two points differentiate them at once from Egyptian work: they are not portrait-statues, and they are meant to be free-standing without regard to architectural setting. The group in the National Museum at Athens may be taken as typical. These belong to the sixth century B.C. and form a series illustrating the transition from primitive stiffness towards the freedom characteristic of Greek art in the next century.

Fig. 1 is from Orchomenos in Boeotia⁶ and from the type would seem to be one of the earliest of the series and to date from the first quarter of the sixth century.

Fig. 2 was found in the temple of Apollo at Sunium⁷ and is of approximately the same date.

¹ W. Deonna, *Les Apollons Archaiques*, Geneva, 1909, p. 27.

² Perrot, *Histoire de l'Art*, VIII, p. 712.

³ Diodorus Sic., I, 98.

⁴ Pliny, xxxiv, 83.

⁵ E. A. Gardner, *Naukratis II*, p. 41, pls. vii, 1, and xxi, 778.

⁶ Nat. Mus. Athens, no. 9. Deonna, *op. cit.*, no. 26.

⁷ Nat. Mus. Athens, no. 2720. Deonna, *op. cit.*, no. 7.

Fig. 3 is from the temple of Apollo at Delphi¹ and is in the Delphi Museum. It is the well-known Biton of Polymedes the Argive and must therefore date from early in the sixth century.

Fig. 4 is from the sanctuary of Apollo at Ptoion in Boeotia.² Its approximate date is 550 B.C.

Fig. 5 is from the sanctuary of Apollo at Melos³ and belongs to the second half of the century.

Fig. 6 is from the temple of Apollo at Ptoion. It is of the most recent type in the series and dates from the end of the sixth century.⁴

These statues show certain characters which at once suggest an Egyptian inspiration. Such are, their frontality (meaning that if an antero-posterior median section were made, both halves would be exactly alike), the rigid pose with arms extended stiffly downwards and in contact with the flanks, the square shoulders, broad in proportion to the slender body. Some writers are prepared to explain all these as merely the natural crudities of any primitive art and Egyptian only so far as Egyptian convention chose to retain them. But two features would be hard to account for thus: namely, the advanced left foot, and the hand grasping a cylindrical object reminding us of the staff held by the Egyptian figures of the deceased. Primitive art would have found as much stability in advancing the right foot, but this is rarely done. In the primitive high-relief known as Kitylos and Dermys (Fig. 7)⁵ the two figures have the adjacent feet advanced, but this is obviously only for the sake of symmetry. Writers better versed in Greek than Egyptian art are apt to attribute the muscular flaccidity of these early statues to an Egyptian source. This is unjust to Egypt. The modelling of the musculature in Egyptian statues is often ill-defined and incorrect, but it is never flaccid. Flaccidity is incompatible with the effect of strength and stability inherent in the sculpture of Egypt.

There is a series of characteristics, not less obvious, which sharply differentiate these statues from Egyptian work. They are nude, a rare thing in Egyptian figures, especially those of stone. The trunk has an exaggerated slenderness and the back often a strongly marked lumbar curve and gluteal prominence. The treatment of the hair, and the not infrequent downward and inward slope of the eyes, are not Egyptian in character. There is a tendency to freedom of pose, which in Egypt belongs only to relief sculpture: the arms take on a flexion, the increase of which is not merely commensurate with the lapse of time, for the Kouros of Delphi,⁶ which cannot date later than the second quarter of the sixth century, has a much greater flexure than that of Tenea which belongs to the second half.⁷

In many of the Apollos much more attention is paid to the abdominal musculature than we find among Egyptian artists, who never delineate more than the *linea semilunaris* bounding the *recti* laterally and the *linea alba* between

¹ Delphi Museum. Deonna, *op. cit.*, no. 66.

² Nat. Mus. Athens, no. 10. Deonna, *op. cit.*, no. 28 and p. 292.

³ Stais, *Marbres et Bronzes du Musée Nat. d'Athènes*, 1907, pp. 6, 7.

⁴ Nat. Mus. Athens, no. 1558. Deonna, no. 114. Stais, p. 10.

⁵ Nat. Mus. Athens, no. 12. Deonna, no. 30. Stais, p. 6.

⁶ Nat. Mus. Athens, no. 56.

⁷ Delphi Museum. Deonna, no. 66 and p. 61.

⁸ Munich. Deonna, no. 80.



the two muscles. We may note however that the early Greek sculptor, though he depicted the *lineae transversae*, never did so correctly: the earliest of our series (Fig. 1) has three transverse lines, and the latest (Fig. 6) has four, and all are in the wrong place.

We now turn to the group of archaic Apollos characteristic of Ionia and the eastern Mediterranean islands, Samos, Rhodes, and Cyprus. The origin of their name is the same, but they are of smaller size, mostly mere figurines. Fig. 8 is from Cyprus,¹ Fig. 9 from Rhodes,² and these are some of the oldest of the series, dating from the end of the seventh century. Fig. 10 is from Naukratis³ and probably dates from about 570 B.C. This group has a crudity far beyond that of the western statues. Figs. 9 and 10 show the unnaturally high pectoral muscles, the attenuated waist, the flabby, distended abdomen and the over long thighs. Certain Egyptian features are in evidence, as, the advanced left leg, the rigidly extended arms, and a head-dress resembling that of Egypt, a feature not found in the western group. Fig. 11, a figurine from Knidos⁴ shows such a head-dress, but a body of the western type.

The clothing of the body forms another distinction between the eastern and western groups. The races of the near East affect heavy clothing and reproduce it in their art. But as regards the male figure, Crete delights in the semi-nude, Greece and the Cyclades in the nude, and this from the very beginning. Beyond an occasional waist-band⁵ or loin-band (Figs. 1, 2), the western group entirely ignores clothing, but in the east we can trace the course of the conflict between dress and nudity, and the ultimate compromise. Early Cypriote statues are clothed (Fig. 12), and the very early Cypriote "Apollo" (Fig. 8), though exhibiting every feature of the body, is covered with a long diaphanous garment, falling in folds to his feet. At Naukratis clothed types preponderate, and even the shendet increases to inordinate length.⁶ Flute-players at Rhodes are fully clothed⁷ and wear an Egyptianised head-dress (Fig. 13). At Naukratis they may be clothed,⁸ or naked except for the Egyptian head-dress (Fig. 14).⁹ The nude Apollo in figurine form does appear at Naukratis and elsewhere in Lower Egypt but even in these there is sometimes an attempt to indicate clothing either by an incision across the chest, representing the upper limit of the garment, or by paint of which faint traces still remain.¹⁰ So far we have found little to indicate that the debt of Greek art to Egypt is either deep or lasting: in the west perhaps nothing but a pose; in the east merely some details of dress. It remains to consider whether the underlying principles of either art are related to one another. To compare the arts of different countries is never easy, and least of all when one is notorious for its conventions and the other for its freedom. Egypt had a Canon, or the rules of proportion followed in its schools of art, and the numerous squared studies remaining to

¹ Deonna, no. 140 and p. 305.

² British Museum. Deonna, no. 135 and p. 299.

³ British Museum. Deonna, no. 148.

⁴ British Museum.

⁵ See also Deonna, no. 83, from Melos.

⁶ *Naukratis* II, pl. xiv, 14.

⁷ British Museum.

⁸ *Naukratis* II, pl. xvii, 4.

⁹ Petrie, *Naukratis* I, pl. ii, 7.

¹⁰ *Naukratis* I, pl. I, 2, 9. Cf. *Cairo Cat. Greek Sculp.*, p. 1, note 1.

us make it easy to become familiar with this. For the Greek work there are no mapped-out studies; Polyclitus' writings are lost, and his canonical statue, the Doryphoros, is known only in copies; Vitruvius' scanty remarks on the canon refer to a late form and have no reference to the early Greek work. Moreover, the canonical divisions of parts can hardly have been the same in the two countries. In Egypt the division referring to the head is taken from brow to shoulders, and this is one ninth of the whole in the Old Kingdom, Middle Kingdom, and New Kingdom, and one seventh in the Late period. But the head of Polyclitus and that of Lysippus is measured from vertex to chin. The necks of Egypt and of classical Greek art tend to shortness, while those of the Apollos, especially the eastern ones, are long. A further difficulty in comparing proportions arises from the distortion of the frontal-profile position, which makes it impossible to deduce the ratios of shoulders waist and hips except from the statues themselves. M. Deonna¹ refuses to recognise the existence of any canon in these early Kouroi, or at most he limits it to a few accepted proportions, such as that the distance between the nipples is equal to the length of the foot. If there is a canon it can only be deduced from laborious measurements of many statues such as Kalkmann has made for a slightly later period.² But in this we are baulked by the fact that very few of the Apollos are intact, so that measurements must be taken from restorations which are themselves deductions. The difficulties thus stated, the value of the comparisons which follow can be estimated.

In the Egyptian "canonical" squaring the upper horizontal, that is to say the eighteenth or the twenty-first according to the period, passes roughly at the frontal border of the head-dress³ but may have no definite reference to it.⁴ The next line generally corresponds to the end of the nose, but may pass through the mouth, and the third line demarcating the head coincides with the shoulders and leaves the chin indefinitely between the two lower lines. In the statues themselves, however, we may observe a tendency at all periods for the head to fall into three equal divisions,⁵ namely, vertex to eyebrow: eyebrow to end of nose: end of nose to chin, thus producing a somewhat short face. The oldest Greek canon deduced by Kalkmann⁶ is also a division into three, but the dividing points are different, namely, forehead at roots of the hair to inner angle of eye: angle of eye to mouth: mouth to chin, producing a face very long in its lower part. The faces of the Apollos are long in proportion to their width, but they have not this particular disproportion: indeed so varied are their ratios that one must conclude that these early sculptors were already judging by the eye. Uniformity may occasionally be traced in the eastern group but it conforms neither to Greek nor Egyptian canons. We find that in the figurines from Rhodes, Knidos and Naukratis (Figs. 9, 10, 11, 15), the second third of the face begins at the angle of the eye,

¹ *Op. cit.*, p. 66.

² A. Kalkmann, *Die Proportionen des Gesichts in der griechischen Kunst*, Berlin, 1893.

³ Lepsius, *Denkmäler* II, 65, Text, 1897, p. 234.

⁴ Prisse d'Avennes, II, pl. i.

⁵ Legrain, *Cairo Stats.* 42127, 42126. Also seated Amenemhat III and Mentemhet, Cairo. Louvre: seated scribe. Berlin: Hertihetep, Tetu, granite statuette (M.K.), In-m-akhut. Leipzig: head of a King. Late period statues at Munich.

⁶ *Op. cit.*, p. 21.

but it may end at the nostrils or the mouth, or between the two. The ratio of the head, measured from vertex to chin, to the whole height is uniformly about one eighth both in eastern and western groups.

Ears, as in Egypt, are too large and placed too high, but in the western group they are not prominent, and the modelling is incorrect and sometimes, as in the Sunium statue (Fig. 2) entirely conventionalised. The ears of Egyptian statues are carefully and fairly correctly modelled. Those of the eastern group of figurines and of Naukratis are intermediate both as to prominence and modelling (Figs. 13, 15).¹

Shoulders. A first inspection of the shoulders of the Kouroi gives an impression of width and squareness. Examination shows that the squareness is not constant and that the appearance of width is deceptive, resulting only from the slenderness of the body. In the canon of Polyclitus, the ratio of shoulder-width to whole height is three to ten. In the Apollos, it is never more than $2\frac{1}{2}$ to 10, and sometimes it is only $2\frac{1}{3}$. The Egyptian "canonical" ratio is about 3.3 to 10, but, turning to the statues themselves, the shoulders are proportionately narrower even in the Old Kingdom. Ranefer shows a ratio of a little over 3 to 10, but otherwise² the proportion is under 3 and may sink to 2.6.³ In the M.K. shoulders are still narrower: the statue of Senusert⁴ shows a ratio of under 3, while that of the Ka statue of Hor⁵ is about 2.5. Late statues at Munich (Fig. 16) show about the same proportion. Turning to the eastern group of Kouroi, the shoulders have an even greater width compared with the body, but the ratio as regards height is about the same, namely, $2\frac{1}{2}$ for the Rhodes statuette and $2\frac{1}{3}$ for that of Naukratis (Figs. 9, 10). In this respect, then, the Greek sculptors approximate to the later Egyptian statuary but certainly not to the canon as exhibited by the squares.

Waists. The slenderness of the waist in proportion to the width of the shoulders is obvious in the Greek figures. The points of measurement taken for these two dimensions are the narrowest diameter of the trunk wherever that may be, and the greatest width between the upper arms held in apposition to the body. The natural point to choose for measurement would be the extremity of the acromion process, but in practice it would be mere guess-work to make use of a point which both Greek and Egyptian artists either ignored or placed with the utmost inconsistency. The measurement of greatest width involves the inaccuracy due to the varying thickness of the deltoid muscle, but at least gives us a point which is not arbitrary. The ratio waist: shoulders in the canon of Polyclitus is a little under 3:10, i.e. about 67%. The Apollos are much more slender, the usual ratio being 50%, though it may reach 52 (Fig. 5), or even 55 (Fig. 6). The Naukratis Apollo shows 50% (Fig. 10), that of Rhodes only 36.6. Turning to the Egyptian statues, the similarity in ratio is greater than their more sturdy appearance would suggest. The waist of Ranefer is only 50% of his shoulders, and a series of Dyn. V statues at Cairo⁶ shows ratios varying from about 54 to 57%.

¹ See also *Naukratis* I, pl. I.

² *Cairo Stats.* Borchardt I, 23, 51, 99, 133, 205.

³ *Ibid.*, 132.

⁴ *Karnak Stats.* Legrain I, 42014.

⁵ *Cairo Stats.* Borchardt I, 259.

⁶ *Ibid.*, 23, 51, 99, 132, 133, 205.

Menkaura¹ and Sepa² have 56·60/o, Rahotep and the Louvre Scribe 60. The waists of Middle Kingdom statues may be even narrower, usually about 50/o.³ Nevertheless the correspondence with the Kouroi is rather in figures than in reality, for the narrowness of the M.K. and O.K. waist, except in a few cases such as the Ka statue of Hor, is produced rather by a sudden constriction above the ilia than by a general slenderness of body, as in the Kouroi. The same applies to the New Kingdom, although the constriction is less marked. In the Late period, though the ratio remains about the same, the abrupt concavity of the waist disappears, the outlines are much more true to nature, and the ratio is due to a general slenderness resembling that of the best of the western Apollos (cf. Fig. 16).

Umbilicus. In the canon of Polyclitus the distance from pubic arch to umbilicus is the same as the length of the face, i.e. one tenth of the whole height measured from the forehead at the border of the hair. Anatomically this is the correct position, the umbilicus lying a little above the highest level of the iliac crests. Only in the few naked Egyptian statues can the same measurement be taken, but in these the ratio is the same, and the ratio to the whole height in the clothed figures is the corresponding one. Moreover, the position of the navel in the late canonical squares shows the same proportion. Its relation to the hip-bone is nevertheless generally wrong, for, though the iliac crests are not indicated with any precision, they unmistakably extend higher than the navel—the anatomical inaccuracy being in the position of the ilia, not the umbilicus. This precision as to position, added to the fairly correct modelling, and the fact that in the typical sculpture the umbilicus is always exposed, suggests that some special importance may have been attached to it. This exposure has led to an unnatural placing of the shendet, which, whether, it slopes from back to front or not, passes round the ilia, not the waist.

It would be reasonable, then, to expect any primitive artists learning their work in Egypt to follow their models in this matter, but the umbilicus of the Apollos is always too low, both as regards actual measurement and in relation to the ilia. This applies to both groups, but is more marked in the eastern one (Figs. 8 to 11). No attempt is made at a correct modelling: a tiny excrescence, a small circle, two concentric circles, an eye-shaped marking horizontal or oblique, any of these is enough.⁴

A comparison with the precise vertical measurements of the Egyptian canon is difficult, owing to the mutilated condition of the majority of the Apollos. Taking the later canon, we may assert with tolerable certainty that the length from sole of foot to spring of shoulders is proportionately less in the Apollos, and the head-neck measurement greater. The head approximates to one eighth of the height and the face to a tenth. The face of the Takhos coffin is well under a tenth, and that of the O.K. canon slightly under that fraction. The necks of the Rhodes and Naukratis figures are still more elongated than those of the western group. In this respect also, therefore, we fail to find that Greece followed the Egyptian canon.

¹ Cairo triad.

² Louvre.

³ Cairo: Hor, Amenemhat III, Senusert III (no. 42014). Berlin: Tetu, granite statuette, bronze statuette.

⁴ Deonna, *op. cit.*, pl. v.

Turning to statues of women, we find the same rigid frontal pose, with arms closely applied to the sides of the figure if standing, and stiffly flexed over the squarely posed knees, if sitting (Fig. 17, nos. 4, 5, 6). Again the reminiscence of Egypt is irresistible, and again the resemblance becomes less clear on analysis. The pose of the overlong arms is rather primitive than Egyptian, and resembles more the terra-cotta figurines of Artemis Orthia at Sparta¹ than the finished art of Egypt. The date of the figurines at Sparta is about 740–600 B.C. The same applies to the pinched-in waist of the standing statues, while the Doric chiton, and himation of the seated one, is altogether Greek. The head-dress bears some resemblance to an Egyptian wig, but the sudden bulge under a constricting band does not occur in Egypt except in the case of royal ladies, and the few thick tresses falling forward over the shoulders belong rather to the type of the "Kore." On the other hand, the archaic Cretan bust in the Museum at Candia has hair precisely similar, and so have the ancient Dorian figurines and other terra-cottas of the temple of Artemis Orthia at Sparta.² These seated statues were found in Arcadia and are apparently funerary, since one bears the inscription Ἀγασό.³

The "Kore" statues form the next typological group. They belong to the same century as the Apollos and appear to be parallel in idea; symbolic, that is, of feminine perfection, but not portraits. They are of full physique and completely clothed in draperies, at the same time ample and graceful. Were it not that the left foot is advanced, we should be inclined to say that they show no Egyptian influence at all. They would seem to be later in date as well as style than the statues in Fig. 17, for one of them bears the name of Antenor, sculptor of the group of the "Tyrannicides," dealing with an episode which did not take place till 510 B.C. Some, of more primitive type, may be intermediate in date,⁴ but the type itself was certainly fully evolved in Ionia by 550 B.C. as seen on the west end of the Harpy Tomb at Xanthos in Lycia. Here we see three maidens bearing offerings to a seated figure, probably Persephone, the "Kore" herself, while the goddess and one of the maidens raise blooms to their faces, in a manner recalling the scenes of Egyptian tombs (Fig. 18).

The "Kore" herself, however, is to be found on Egyptian soil (Fig. 19). M. Ch. Picard has recently redirected attention to the "Kore of Memphis"⁵ which shows the interaction of Egyptian and Greek art in a quite exceptional way. The clothing is precisely as in the Athenian Koros, and so are the tresses falling in front of the shoulders. The arms are flexed, the left having probably held an offering and the right supported the cloak. On the other hand, the left foot is advanced, as in Egypt, the forearms have been attached by tenons, the eyes and eye-brows have been scooped out for inlay. Moreover, though the position of the tresses in front is that of the Kore, yet they have been formed in some coloured substance, of which now only the grooves remain, and not merely painted after the manner of the Greek artist. The large ears, pierced for pendants, would be proper to either country.

¹ British School at Athens, Sanctuary of Artemis Orthia at Sparta, 1929, pls. xxviii to xxxi, pp. 146, 147, and Fig. 107.

² *Ibid.*, p. 154, Fig. 109, and pl. xxxv, 2.

³ Stais, *Marbres et Bronzes*, 1907, p. 10.

⁴ Acropolis Mus. Athens, no. 679.

⁵ *Annales du Service*, 26, p. 113. Cairo, Greek Stats. 27431.

If the Greeks learned from Egypt, where was their school? At once Naukratis suggests itself, the meeting point of the arts of Assyria, Milesia, Samos, Lesbos, Rhodes, Cyprus, Cyrene, Samos.¹ But there is little evidence of its being a place of study, although the very oldest type of Apollo (Fig. 10) dating from the early sixth century is found here. Here also was found the name of Rhaekos, and here an unmistakably pure copy by a Hellenised hand (Fig. 20) of a small Egyptian statuette. Both original and copy are in the Petrie Collection at University College London.² Moreover the Kore of Memphis combines the characters of both countries with a balance which makes it difficult to say whether the artist was a Greek who had studied Egypt or an Egyptian who had studied Greece.

On the other hand, if Naukratis were a school we should expect to find much evidence of copying. But such a copy as the one mentioned is rare, perhaps unique. Mixed types are found, but they carry little evidence of the hand of the Greek learner: Cypriote and Rhodian figures as well as Greek take on an Egyptianised head-dress (Figs. 9, 12, 13, 15).³ Motives are rather contributed than learned, e.g. the playing on the double pipes from Rhodes, and the person holding a kid or the god a lion.³ The Good Shepherd motive is found in Greece from the earliest times of sculpture, as the Acropolis "Moschophoros" shows, but it has little place in earlier Egypt, unless perhaps in caricature.⁴ Such figures as that in Fig. 22 are given by Greece to Egypt, not by Egypt to Greece.

And now as to the Apollos, with whom this enquiry began. The figures from Naukratis and neighbourhood are all diminutive, whether of terra-cotta, alabaster, or limestone; but the Kouroi of the western group are life-size or larger, or, if under it, never so small as to deserve the name of figurine. The figurine Apollos have certain affinities with Egyptian work, namely the straight back and small buttock, the usual pose of legs and arms, and a head-dress more or less Egyptian. Unfortunately most of the Kouros figurines at Naukratis are headless, but one found at Sais shows a head-dress more Greek than Egyptian, with hair closely applied to the neck and in front forming a perfect arc over the forehead. Several heads found in the vicinity appear to belong to the same type.⁵ Writers on the classical side are prone to enumerate certain other characters of these figurines which they classify as Egyptian, such as the large round face, the narrow mouth, the straight unsmiling eyes, the flaccid limbs, the large inflated abdomen.⁶ To anyone acquainted with the portrait statuary of Egypt, with its air of stability strong enough to outweigh its undeniable muscular inaccuracy, such an enumeration only accentuates the distance between the two arts. We may then concede that the art of the figurine Apollo is a mixed one, into which enter Egyptian, Oriental, and Greek elements, but that Greece took more than it gave cannot be maintained. Still more obvious is it that the western Apollos were never derived from these eastern hybrids,

¹ *Naukratis* II, pp. 38, 49.

² See also E. A. Gardner, *Art of Greece*, 1925, pl. xi.

³ *Naukratis* II, pl. xiii, 5, xiv, 9, 10.

⁴ Berlin, reproduced in Fechheimer, *Kleinplastik*, pl. 73. *Brit. Mus. Quarterly*, vol. IV, no. 4, 1930, pl. LIX, h.

⁵ *Cairo Cat. Greek Stats.* 27425, 27427, 27428. Deonna, p. 290.

⁶ Deonna, p. 290.

whom they resemble in nothing but nudity and the position of arms and legs. That these figures differ in nearly all other particulars from the statuary of Egypt has been already argued. It is worth while also to notice some things which Greek art might have learned from Egypt and manifestly did not. There is the use of the frontal-profile pose in reliefs, in which the Egyptian artist avoids all appearance of awkwardness in treating the position of the limbs. Compare with this the Delphi relief (Fig. 21) in which the artist has slewed round the scapular muscles to the front in order to bring the arm into profile, or with the Nike of Achermos, whose profile legs and frontal body suggest an entire absence of anatomical continuity.

Nor is it beside the mark to note what Greece was doing at this period of alleged tutelage, but obviously with no reference to Egyptian work at all. There is the Artemis of Nikandra, dating from the second half on the seventh century. It is a standing figure costumed like the seated women in Fig. 17 and it has not even the advanced left foot. Nor has the Hera of Samos, whose date is about 550 B.C. and whose pose and drapery are already on the way to the later Greek style. About the same date is the "Moschophoros" of the Acropolis. His legs are gone and of the position of his feet we can say nothing, but his arms are freely flexed in the familiar Greek motive of the man carrying an animal on his shoulders.

The duty of the Egyptologist is done when it is shown that the essentials of Greek art did not come from Egypt. To suggest whence they came would be to intrude on the province of classical scholars. Only it may be permitted to equate with the Rhaecus-Samos legend in the east, that of Daedalus-Crete in the west. The slender waist, the waist band, the pronounced lumbar curve, the hair dressed in elaborate spirals on the brow, these belong to the Kouroi of the Cyclades and the Greek mainland, and it was on the mainland that the Cretan Daedalus founded his schools.

EDITH M. GUEST.

QUEEN MERYT-AMON.

IN the winter of 1928-9 the Expedition of the Metropolitan Museum of New York discovered the tomb of a Queen Meryt-Amon. Mr. Winlock has shown conclusively that this queen cannot be the Meryt-Amon of the reign of Aohmes I, and it is equally certain that she is not the daughter-queen of Rameses II. There remains only the daughter-queen of Tehutmes III. As very little is known of this Meryt-Amon, a fragment of inscription bearing her name may be of interest. The inscription is on the four sides of a rectangular stand of fine



white limestone. The purpose of the stand is uncertain as the object which it supported has been broken away; the section of the object is circular; it cannot have been a statuette for there are no traces of the feet of either a standing or a seated figure, and the section of a kneeling figure is almost always more or less oblong. It may have been a vase, though I cannot call to mind a circular vase on a rectangular stand belonging to this period; or possibly it was a figure of Harpocrates on a lotus. The inscription reads: "(1) Made by (2) the *hmy-k'* of queen Meryt-Amon, (3) Amenhotep, (4) Hathor, chief of Thebes." The size is (in centimetres), 9.5×8.8 ; height 2.5; diameter of circular object, 5. The piece was bought by Prof. Petrie at Qurneh, and was probably part of the tomb furniture of the queen; it is now in the collection at University College, London.

M. A. MURRAY.

REVIEWS.

Ancient Egyptian Masonry, the Building Craft. By the late SOMERS CLARKE and R. ENGELBACH. Large 8^{vo}, 242 pp., 268 figs. and plates, 1930, 63s. (Oxford University Press).

Here is a long-needed book on Egyptian building, by practical experts, architectural and engineering. The matters have not been so thoroughly studied before, and this takes its place as a standard of reference, quoting and discussing examples of the treatment of every part of a building.

The first chapter begins with a very reluctant admission of the architectural features originating in vegetative forms. It is said that the discovery of the buildings of Zeser at Saqqarah "compelled scholars to revise their views very considerably on the birth of masonry in Egypt." The difference however is not a revision but rather a filling of detail: the columns with hollow fluting and with projecting fluting were already in the architecture of the 1st dynasty (R.T. II, xxxiv, xlv), only the copying of wood in stone is new. The matwork pattern of the panelled rooms is also of the 1st dynasty (R.T. II, xli, 69; xlv, 29). The stonework of Zeser shows the obviously tentative use of small blocks, and does not encourage us to anticipate any change in our dating of stone building. The strange capitals, Figs. 5, 6, seem to have been left blocked out, and to have been for Hathor heads with cows' ears and the pendant wig each side. The ornamental use of the Hathor head is also of the 1st dynasty (palette of Narmer). It is the extent of the work, rather than any new feature, which has surprised us. In every direction the wooden origins are visible, as in the carved stone doors.

The quarrying is next described, the method of cutting the stone out of the rock, the working lines and tools. There might be added detail of the surface as left at different ages: the hammer-dressed, the stone pick-dressed, the adze work, chiselling, and the Roman claw-tooling. The vertical grooving to get out pillar blocks, and the circular cuts for columns are worth notice. The difficulty of accounting for long stroke cuts on granite is fairly stated, and the impossibility of supposing steel to have been used. The matter is left at the possibility of some unknown treatment of copper or bronze, which has disappeared in the course of time. It is justly said that the skilled handling of a hammer and pick will do things that are impossible to a novice. The pounding out of trenches for detaching a granite obelisk, has been well worked out by Mr. Engelbach. The difficulty of undercutting an obelisk seems however the worst point, and obelisks were too near the danger limit of length for wedging to have been allowable. Perhaps the horizontal pounding was done by hanging the pounders by a rope, as battering rams were used, and in this

form it would be rather less fatiguing than the vertical pounding. The wooden handles must have been about twice as long as the breadth of the obelisk, with a counter poise on the outer end. The cutting out of quartzite is described, concluding that a metal punch point was used, to bruise out the holes for wedges. On statuary the hard stones were cut out by metal saws and tube drills, the evidences of which were published in 1882 from Gizeh.

The structure of Transport-Barges is described. The Egyptian scorned difficulty when he made a barge to carry two obelisks at once, end to end. Such a barge was towed by 3 lines of 10 boats, each with 30 rowers, 900 in all. The appearance of three lines of thwarts, on the sides, leads to a suggestion that the support was not by a boat, but by a raft of boat form. Now a boat requires a submerged capacity of nearly three times the bulk of the granite, but logs of wood must be more than six times the bulk of stone to support it. Yet if the obelisks were above the thwarts, the boat must be very wide to be stable. The triple line of thwarts rather points to the support of the great weight above them, and the need of firmly uniting the sides. It might be noted that the rotating steering-oar is still in use on large boats at Lake Como. The straddle double mast is said to date from Snefru, but it was used in papyrus boats of prehistoric age (Univ. Coll.), and indeed it was necessary on papyrus boats, of which the sides were much stronger than the bottom. In later times, the stacking of the mast on two supports when rowing down the Nile is not only figured, but is modelled in detail, with the bundle of sail upon it (*Gizeh and Rifeh*, xc). The entire absence of pulleys in shipping is noted as evidence that the value of the pulley was disregarded.

Under Preparations for Building, the remaining scale drawings and plans are described. The ceremonies of the foundation are figured, but the varied contents of the foundation deposits are not named. The levelling of the Great Pyramid is supposed to have been done by flooding the whole area with water; it would require more than 600 tons of water if only half an inch deep. It would, moreover, be very difficult to make that area, with many rock fissures in it, all watertight, and such a mode would be impossible on the top of a course of very absorbent casing, which yet is levelled to a fiftieth of an inch. Perhaps a system of long reed tubes, waxed at the joints, and ending in cups, would be the most possible method. Cubit rod are named, but a note of doubt as to subsidiary measures is needless, as the fist, little span, great span, little cubit and great cubit are all named on the rods. A paper in this Number, p. 38, shows that the little cubit was the unit used for two of the pyramids. The methods of laying out a site truly square are discussed, but hardly conclusively. A right angle can always be set out by the sides proportionate to 3, 4, and 5; or else by striking equal arcs from any two points.

The poorness of the foundations is described, small stones of friable quality underlying the colossal columns. The establishment of many courses of large blocks for foundation is due to the Ethiopian xxvth dynasty.

The next chapter deals with mortar which is mostly plaster of Paris with a little lime; in Roman times lime became usual. The horizontal joints present no difficulty, but the fineness of the vertical joints at the Great Pyramid is entirely unexplained. The average vertical joint width is only a fiftieth of an inch, so certainly the thinnest cream of plaster could not run into such a joint. The plaster was very fluid, as it has run down freely in lines, where the stones

do not touch in the middle. But if thin plaster were painted on along a joint surface, how to bring up a block of many tons' weight rapidly enough, before the absorbent stone stiffened the plaster, and how to make enough pressure to close the joint so finely, is unexplained. (See this Number, p. 35.)

The handling of blocks is discussed. Essentially the means were unlimited hauling power, the roller, and the lever. No pulley, winch or capstan can be credited. The sled of heavy timbers was usual beneath a block. The earth bank for a slope to raise big blocks was used, as well as earth filling of halls as the work progressed. The difficulty of keeping verticality is supposed to have been settled by plumb bobs in pits; but it would be more in consonance with known methods to set up the corners first, or walls outside the corners, and then stretch a string, or sight the courses truly in line, between them.

The Dressing and Laying of blocks is next studied. The strange verdict is that "the Egyptian does not seem to have acquired the idea of testing a block with a square"; yet the reverse appears on p. 100, and the square figured in this volume (264) would be useless by the side of the plummet and level, except for stone dressing. The presence of sloped joints on the face, and of skew joints across the wall, is very fully discussed. The reason for such joints obviously was to save trimming away much stone which could be saved by such accommodation. The proposed method of making such adjustment hardly seems practical with heavy blocks, as it would require much shifting in the process. It might be perhaps easier to begin by a slope cut finished on the second stone, and laid, back down on a sand bed touching the first stone, then the face and two bed joints could be trimmed and finished as it lay, in line with the first stone without a single shift. For dressing down a face, the method,—not named in this work,—was to saw along the edges about an inch inwards, and then to chisel down the face to the plane of the saw cuts. The method of handling one of the great fifteen ton casing-blocks of the pyramid, and bringing it up flush with the next, is discussed at length. Sliding on the bed is comparatively simple, but bringing it up against its fellow at the side is the main trouble. One solution is described in the article on pyramid building in this Number, p. 35.

The use of dovetails is stated not to have been for any strengthening of the wall, but it is suggested that they served to prevent shifts before the mortar hardened. The careless way in which walls were formed by two faces with rubble between, seems incredible to us when we look at the disastrous collapse of such shoddy aggregates. Sad was the fall from the ivth to the xixth dynasty.

The chapter on Pyramid construction is inconclusive on the main issues, though describing much of the visible detail. The article on the subject in this Number attempts to reach a workable solution. It is remarked here that there is no reason to believe that the Egyptians recognized that the Π ratio was incommensurable. As, however, they actually used two different approximations, $7 : 22$ and $81 : 256$ (or 3.1428 and 3.1605), they cannot have regarded either as exact.

Pavements and column bases are next examined. In this there might be mentioned the width and shallowness of early column bases, inherited from the wide stone needed to base the wooden column, and prevent it sinking in the alluvial soil. The chapter on columns deals with structure rather than with the detail of all the types. In this connection, the superiority of the vth dynasty

in using hard granite columns enabled them to leave a clearer space than in later building. The style became hopeless when a gigantic building was entirely of weak sandstone, and the bulk of the columns filled up the view. The account of roofing follows, describing the various fallacies of construction which were smothered with plaster and paint. The different effective ways of forming a rain-proof flat roof are drawn in detail. No mention is made of the very effective provision of a sand bed, over brick tunnels, deep enough to sponge up all the rain of a storm. As rain seldom penetrates more than three or four inches, except where it runs together, the deep sand bed over the Ramesseum brickwork would effectively keep the brickwork dry.

The doors of wood and the method of hanging them are described, but without reference to the stone models of wooden doors of Zeser. Window openings and ventilators are figured of various types. The grilles of stone window slabs are but little known; they were made decorative in the xxth dynasty and onwards. Stairways were usual from the first dynasty, and as heavy weights had to travel on them there was usually a broad band of slope on either side of the stair, to permit sliding.

The history of the arch has been misunderstood owing to classical prepossession. The brick arch is at least as early as the first dynasty, and as it was used in neolithic Europe it may be as early in Egypt (see *Reallexicon der Vorgeschichte* VII, lxxix). The mode of building an arch without centring is described, but the beautiful domed brickwork of the xviith dynasty is omitted. The half-arch tile-like bricks, used for narrow passages at Qurneh, also deserve mention. The joggled voussoirs usual in Arab work are at least as old as the Ptolemies, as figured here. The facing and sculpturing are described. Among the tools for dressing limestone, the adze should be placed very early. The blocks of the iind dynasty at the Royal Tombs were dressed with a flint adze (R.T. II, 13), the rock sockets of the Great Pyramid appear to have been dressed flat by a copper adze, and the abundance of copper adzes in the first dynasty, without a single chisel, mark what was the favourite tool. The mode of drawing by squaring the surface is illustrated, but without reference to the canons of different ages. The list of colouring materials from Mr. Lucas does not go beyond what Mr. Spurrell and Dr. Russell published forty years ago (*Medum*, 28, 44, 50); the imitative painting is excellently shown in Lepsius' copy (L.D. II, 19-22) and Mrs. Quibell's copy of the tomb of Ra-hesy. The older workers should have the credit.

Lastly there comes the earliest material, brickwork. The 80-foot wall at Tanis is not due to Ramessu II, but to Pasebkhanu of the decadent xxist dynasty. The mode of brickmaking is illustrated. The statement that small bricks were used for houses, and large ones for government works, in "ancient times" is not borne out by examples. In the Royal tombs, bricks increased from 8.9 to 10.5 during the 1st and iind dynasties. In the vith, public bricks are usually 12 to 15 inches, in the xviiiith 15 to 24 inches (*Abydos* II, 51). After that, they fluctuate, and finally decline to 7 inches in Arab times. The variation is much more by age than by purpose. The use of the wavy wall, to allow of fluctuations of level without cracking, is not noticed. The movement of the ground owing to the rise and fall of the Nile is a serious difficulty.

An outline of the methods of Egyptian mathematics is given, but the strange way of only using fractions with numerator 1 should be explained as

naturally arising from division of food among workmen, which is also the commonest concrete problem. Appendices deal with the actual tools that remain to us, a map of localities, and an outline of the impossible short chronology. Now that both the old views are dead we may hope to see the reasonable statements of the Egyptians once more trusted.

This work is an indispensable outline of the actual evidences on construction, and the notes made above are only given in the hope that so detailed a work may in future be further completed.

Mathematics before the Greeks. By Prof. R. C. ARCHIBALD. 4^{to}, 12 pp. (Address to Amer. Assoc. Advance. Science, 1929).

This summary view begins with Babylonia, which is so fully documented by cuneiform tablets. The Sumerian arithmetic used 60 as a basis, and not 10, and had a positional notation, so that 16.40 represented 1000, i.e. $16 \times 60 + 40$. Tables of squares and cubes, square roots and cube roots, were in use. The custom of interest on loans at various rates (usually 20 to 30%, or later 5 to 20%) needed much reckoning in accounts. The geometry rose probably to $a^2 + 2ab = b^2 = (ab)^2$; they also had a correct formula for finding the length of a chord, from the circumference of the circle and the perpendicular of the chord. For areas they assumed that $\pi = 3$, hence the area of a circle was reckoned as $\frac{1}{12}$ of the circumference². Other problems seem to show that they had arrived at solution of quadratic equations by feeling the way in various cases. The Egyptian practice is outlined, with its curious building up of fractions, each with numerator 1. High denominators were sought by trial and error. Essentially the whole method has been built up by the custom of dividing food among a party. The more complex questions of unequal shares are all dealt with on practical lines, due to providing men in proportion to their families or wages. In geometry the measurement of volumes was based on a square of 8 being equal to a circle of 9 diameter, or $\pi = 16^2/9^2 = 3.160$. On the setting out of slopes by vertical and horizontal measure there has been much confusion, owing to copyists mixing theory with observation, and Prof. Archibald is thus led to regarding such proportions as absurd. In a note in this number the actual facts are set out. The working by relative proportion was familiar in practice, though not reduced to an ultimate theory. The greatest triumphs in geometry were producing the correct formula for a frustrum of a pyramid, and finding the area of a hemisphere. A method of extraordinary accuracy for finding the side of a heptagon, by ruler and compass alone, was also reached.

When we consider the cumbrous notation used, and the clumsy processes of the geometry, it is astonishing that any such results could be reached in either Babylonia or Egypt. Even two hundred years ago, Newton was struggling with notation in a way that no beginner uses now.

Bibliography of Egyptian Mathematics. By R. C. ARCHIBALD. Large 8^{vo}, 106 pp., 1927 (Mathematical Association of America, Oberlin, Ohio).

This list with appendix is the latter part of the 1st volume of a translation of the Rhind papyrus. The works on the subject are arranged in the order of publication from 1809 to 1930. Where there is any fresh interest in a work, a brief outline of the new ideas is added, and these notes are of much value independently, as memoranda on the gradual understanding of the subject.

It is such a useful summary for reference that a few omissions should be noted, for the next appendix. In the chronological list of documents, the Hierakonpolis mace is placed as an example of notation, so the sample account keeping of the 1st dynasty from a scribe's tomb may be named (*Gizeh and Rifeh*, iii A) and the earliest piece of actual accounting of quantities in the late iiird dynasty (*Meydum*, xiv). The simple geometrical relations of the dimensions of chambers in the Great Pyramid show a close planning of diagonals to produce a result, and more than one example of the π ratio. Gillain's excellent book of 1927 deserves some detailed statement (see p. 69), and the origin of the system of fractions in food division might be noted (*Ancient Egypt* 1928, 124).

Aegyptiaca, a catalogue of Egyptian objects in the Aegean area. By J. D. S. PENDLEBURY. 4^{to}, 121 pp., 5 pls. (Cambridge Press) 1930. 15s.

This is a sound catalogue in detail of some three hundred objects of Egyptian origin found in the Aegean area. The limitations of that area are reckoned to include Crete and the south Peloponnesos, but to exclude Rhodes, which is nearer, and one of the most important centres of Egyptian connections. Beside the main catalogue, there is also a hand list of Aegean objects found on sites in Egypt, for which we may be also very thankful. The polished black amphora and cups of the 1st dynasty found at Abydos might also be included (*Abydos* II, 38); also the plates of Amarna sherds of all kinds (*Tell el Amarna* xxvi-xxx). The plates here are useful, and it would be well if more could be supplied.

The publishers have unfortunately made the book so spacious as to be almost absurd.

The Accuracy of the Old Testament. By J. GARROW DUNCAN. 8^{vo}, 192 pp., 32 pls., 1930 (S.P.C.K.). 6s.

This outline deals with the many instances where the results of modern excavation come in contact with ancient records. The history of Abraham, the conquest of Palestine, Jerusalem, the Canaanite religion, and some other matters are dealt with, pointing out how the physical details that have been found fall into place with the narratives. Such a summary of the recent discoveries in relation to the well-known historical books is much needed by the general public and, until further advances are made, this volume may well hold the ground. A few details may be suggested in addition. The early use of writing among the Hebrews is indicated by their having *shatar* "managers" (literally "scribes") of themselves, under the Egyptian task masters. This implies that the usual registering and account keeping, which the Egyptian always required, was done by Hebrews. The place Mizar or "a little one" to which Lot went, would mean equally well "a step" or short distance, and the naming of Ophel as Mizar would mean "the step hill" referring to the long flight of steps to the Kedron. The shekel of silver of Abraham would probably be 160 or 180 grains, as those were the most usual Syrian units, rather than 105 grains. In the earlier chapters a broad distinction should be made between the Hittites of European origin, who were great stone builders in Cappadocia, and the Hyksos of Central Asian origin who always fortified with earth banks, having lived in great plains. Though the two races were both in Syria, the Hyksos were before the Hittites, and the abilities of the races were very different.

JOURNALS.

Metropolitan Museum of Art, New York.

Egyptian Expedition 1928-9. This bulletin opens with a summary of the previous two years' work, the clearing of the old quarry pit in which the adherents of Tehutmes III had cast the fragments of Hatshepsut's statues at Deir el Bahri; there they had been buried under a million cubic feet of earth from the work of the Egypt Exploration Society. M. Naville never thought what a treasure of sculpture he was burying in the ground which he had not searched. The fragments were not only in the quarry, but many have been found carried away as waste stone nearly half a mile distant. Many pieces that lay visible had been removed during the last century to museums, and the chase now is to reconstitute the new fragments with those already known. Two heads in Berlin, and a torso at Leyden, can be made up as complete figures, and are to be set up at these museums. One of the two colossal Osiride figures of the queen has been built up and set in its old place; even with the top of the crown lost, it is twenty-six feet high. The work of sorting hundreds of fragments and tracing their connection is more congenial to a museum curator than it would be to any one seeking for history.

Beside the quarry pit, there was another place where dumps had been deposited, on the slopes of fragments at the foot of the cliffs north of the temple. This region was therefore attacked in three stages, one above the other, and the ground gradually cleared. After six weeks of work, a hole in the rock appeared. This led to a passage which passed close beneath the portico of the temple, in fact baring the foundations. Further on was a deep pit across the passage, and beyond it the coffin and mummy of a royal daughter, sister, and wife Merytamen, daughter of Tehutmes III. The great outer coffin about 11 feet high was, of the type of those early in the dynasty, such as Aahmes Nefertari, covered with glass inlay of network pattern. Inside that was a natural-sized coffin. The whole had been plundered, and the body stripped: but the mummy was decently re-wrapped, covered with wreaths, and replaced in the two coffins, by the care of Masaharti the high priest in the xxist dynasty. A few years later, the tomb had been reopened to place the burial of a daughter of Panezem, which was found in the passage before reaching the trap well. A small object naming this Meryt-amen, now in University College, is published by Miss Murray in the present number.

The graphic work of the year is reported by Mr. Davies. The end of the copying of the tomb of Rekhmara has been reached, so we may hope to see a definitive edition of perhaps the most important tomb at Thebes. The report describes in detail the remains of tomb 120 of Oanen, the brother of queen Tiy. Much of it had been wrecked in the Atenist fanaticism, but part of the figures

of Tiy and Amenhetep III remain, with a frieze of kneeling captives beneath their platform. The figure of the Kefti is certainly not a Cretan, but clearly a Syro-Hittite, which accords with Mr. Wainwright's careful analysis of all the evidence (see *Ancient Egypt* 1914, 172). This showed clearly that Kefti was not Crete, by systematic evidence that has been ignored in Germany and by those who follow the fashion. The figure here with North Syrian dress and Hittite boots would accord well to the Kefti being in the eastern part of Cilicia, as Mr. Wainwright concluded. The Cretan objects brought by the Keftiu only show that they acted as middle men in the trade. Mr. Davies resorts to the usual transfer of blame to the Egyptian artist for confusing different peoples; the confusion lies in the modern bias. There is no ground for "crediting the Egyptians with surpassing ignorance of their far empire." The boot is on the other foot, read modern for Egyptian.

The drawings of granaries, and figures of the King in the harvest thanksgiving, are carefully discussed. A pair of granaries, with a ramp of ascent for filling them, is said to have been "recently found at El 'Amarneh"; but such a pair with a ramp 85 feet long was already published in 1894 (Petrie, *Amarna*, xli). By the bye, why is the name Amarna now decorated with a prefixed ' and a final h? It is merely a modern concoction from Amarieh and the Beni Amran in the neighbourhood; if we are to be precise, then one of the genuine names must be applied to the ruins, to which it does not really belong. Pedantry is bad enough, but pseudo-pedantry!

xxv. No. 1. 1930. *Exhibition of wall paintings*. This notice contains some illustrations of the most delicate examples.

NOTES AND NEWS.

THE half-century celebration of Flinders Petrie's researches is continuously observed in a series of events, and in formal congratulations from many societies.

June 3. Lady Newnes' "Egypt" *matinée*, attended by 1400 spectators was described in our last issue. The xviiith century leather casket, presented there to Sir Flinders by Captain Spencer-Churchill, contained a congratulatory address, signed by Prof. B. Ashmole, Mr. H. Balfour, Dr. S. Cockerell, Sir James Frazer, Prof. E. A. Gardner, Mr. S. R. K. Glanville, Prof. F. Ll. Griffith, Dr. H. R. Hall, Mr. G. D. Hornblower, Prof. Sir Arthur Keith, Col. T. E. Lawrence, Prof. J. L. Myres, Prof. Karl Pearson, Prof. Sir W. Ramsay, Rev. Prof. A. H. Sayce, Sir Herbert Thompson, Dr. Mortimer Wheeler, and Mr. C. L. Woolley.

June 19. The half-centenary banquet given at the Savoy by Dr. Robert Mond was a brilliant gathering and marked by much genial warmth of feeling, on the part of the 180 colleagues and students who attended it. The two speeches were short, and when the company left the tables adorned with lotus (white water-lilies), they mingled in the reception room. Twenty-five of the excavators trained in Sir Flinders' camp were able to be present:

"In addition to Sir Flinders and Lady Petrie the guests included: F. M. Viscount Allenby and Viscountess Allenby, Lord and Lady Melchett, Prince and Princess Wiasemsky, the Bishop of Gloucester, Sir Henry Birchenough, Lady Burghclere, Sir Charles Close, Lady Evans, Sir James and Lady Fraser, Sir Richard Gregory, Sir Charles and Lady Marston, Sir Frank and Lady Newnes, Sir Denison and Lady Ross, Sir Herbert Samuel, Sir Andrew Taylor, Sir Robert and Lady Witt, Mr. H. G. Wells; Mr. Howard Carter, Dean Inge, Prof. Stephen Langdon, the Hon. Henry and Mrs. Mond, Prof. F. Ll. Griffith, Rev. C. B. Mortlock, Prof. Peet, Dr. Seligman, Mr. and Mrs. Leonard Woolley, the Principal of King's College, M. Jean Capart, Mr. and Mrs. N. de G. Davies, Mr. Philip de Laszlo, Prof. and Miss Donnan."

July 9-31. The antiquities of the Neolithic, Hyksos, and Philistine ages recently discovered at Beth-pelet, Palestine, were on view at University College, Gower Street.

A half-centenary fund is in course of collection, so that our coming excavations at Gerar and Tell Ajjūl shall receive sufficient support. Contributions are invited.

H. P.

The Sinai expedition of the Hebrew University has collected Manna, and made an exhaustive study of the subject. They find that it is the sweet excretion of two kinds of scale insect (Coccidae), which suck the juice of the tamarisk. It is akin to the sweet excretion of the aphidae which is the food of ants. It consists of cane sugar, glucose, fructose, and saccharose, but no trace of proteins, so it seems an unexceptionable food.

The Italian expedition under Prof. Farina and Prof. Marro has been searching the desert near Gebeley. They found a late predynastic cemetery with two hundred graves, from which they conclude that the people differed in their ethnological character from those of the historic period. A full report of this work will be awaited with interest.

A long-standing puzzle was said to be cleared up, about the animal of the F sign. It has usually been called a serpent, but representations of it on a plant stem look like a slug. Now Professor Cockerell of Colorado University writes to *Nature* (May 17, p. 745) claiming it as a slug, *Veronicella nilotica*, which has been found by the Nile above Khartum, and on an islet in the Bahr al Gebel. The living animal is dark grey above, and dirty yellow below.

Mr. Robson the zoologist responded to this in *Nature* (June 14) and wrote that the head appendages were like those of the viper and not like tentacles of *Veronicella*. Miss Murray publishes in *Nature* (June 28) the photograph of the earliest example, which is prehistoric Egyptian; this proves that it is a snake and not a slug.